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COOPERATIVE SWEET SORGHUM VARIETY TESTS FOR SIRUP DURING 1971 IN FIVE SOUTHEASTERN STATES

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in cooperation with
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Alabama, Florida, Georgia, and Mississippi

COOPERATIVE SWEET SORGHUM VARIETY TESTS FOR SIRUP DURING 1971 IN FIVE SOUTHEASTERN STATES

By Kelly C. Freeman, Dempsey M. Broadhead, and Natale Zummo[1]

SUMMARY

Thirteen varieties of sweet sorghum, *Sorghum bicolor* (L.) Moench, were evaluated for sirup production at two or more locations. Test data on yield, growth characteristics, erectness, uniformity of stalk size and maturity, disease resistance, and quality indicate that 'Mer. 67-10' merits consideration for release for commercial production. 'GA 710 Sy' was the most productive variety at most locations where it was planted and evaluated.

Diseases of economic importance were rough spot in Alabama, Florida, Georgia, and Mississippi, bacterial stripe in Georgia, and rust and zonate leaf spot in Louisiana.

INTRODUCTION

Experimental plots for testing 13 sweet sorghum varieties, *Sorghum bicolor* (L.) Moench, for adaptation and sirup production were planted in 5 Southeastern States–Alabama, Florida, Georgia, Louisiana, and Mississippi. All tests included 'Brandes' (the standard), 'Mer. 67-9', 'Mer. 67-10', 'Mer. 67-11', 'Mer. 67-17', 'Mer. 67-18' and 'Dale'. Six additional varieties, 'GA 710 Sy', '1845E', '1984E', 'Mer. 70-1', 'Mer. 70-2', and 'Williams' were planted in Florida and Georgia. The tests at Quincy, Fla., and Cairo, Ga., failed because of insect injury and excessive drought.

METHODS

A randomized complete-block design with five replications of each variety was used. Each plot included three rows within an area of 0.02 acre, except at Houma, La., where a single row 12.5 feet long, with two replications, was used for determining reaction to natural rust infection. The seed in most tests were planted with hill-drop planters, with hills 2 feet apart in the drill, and the plants were thinned to three or four per hill. In the remaining tests, the seed were drilled with a spout drill, and the plants were thinned to 6- to 8-inch spacing. The plots were cultivated with conventional tractor cultivators. All varieties were harvested when the seed were in the dough stage of maturity except at Experiment, Ga., where the date of harvest had to be approximated as a result of seed removal by birds.

All stalks from the center row of each plot were weighed to determine gross yield. A 10- to 15-stalk sample was taken at random, then weighed, topped, and stripped of leaves, and finally reweighed to determine net millable stalk yield. This sample also provided a mill sample to obtain juice for Brix and sucrose analyses and a composite-variety juice sample for sirup processing. Each composite-variety juice sample was evaporated to sirup density (108° C) in an experimental steam evaporator. At least two 2-ounce clear-glass bottles were retained from each variety for g sirup quality.

RESULTS AND

In the stalk yield tests the standard variety stalks per acre and tons per acre. The

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and '1845E' (male sterile 'Williams' × 'Wiley' and 'Brandes', respectively) were vigorous in growth and exceeded 'Brandes' by 43 and 24 percent. 'Mer. 67-10' was more uniform in growth and maturity than the other 'Mer. 67' selections, and it exceeded the stalk yield of 'Brandes' by an average of 15 percent.

Table 2 shows the extraction of juice. 'Brandes' stalks averaged 43.3 percent. All varieties exceeded 'Brandes' in percent of juice extracted from the stalks.

Table 3 shows degrees Brix of extracted juice. 'Brandes' juice averaged 18.8 Brix. 'Dale', a midseason variety, had consistently high Brix except in the test at Verona, Miss. An experimental hybrid '1845E' (male sterile 'Williams' × 'Brandes'), showed an 8 percent higher Brix than 'Brandes' at Houma, La.

Gallons of sirup per net ton of stalks as percent of 'Brandes' sirup per net ton of stalks is presented in table 4. 'Brandes' averaged only 15.2 gallons of sirup per ton of stalks, reflecting the effect of drought. In the test at Experiment, Ga., the low percentages for 'Williams' and 'Mer. 67-17' were attributed to the failure of their juices to boil to sirup density. This condition was probably caused by a buildup of starch in overripe stalks, where seeds were destroyed by birds.

In the sirup yield tests (table 5), hybrids 'GA 710 Sy' and '1845E' (male sterile 'Williams' × 'Wiley' and 'Brandes') exceeded the yield of 'Brandes' by 58 and 34 percent. 'Mer. 67-10' and 'Mer. 67-11' were uniform in maturity and produced very high-quality sirup. These two selections originated from the same cross [('Wiley' × 'C.P. Special') × ('MN 1054' × 'Mer. 51-2')]. 'Mer. 67-10' will be further evaluated for release for commercial production.

The days from planting to harvest of the varieties are shown in table 6. Drought during the growing season extended the number of days required for maturity (dough stage of seed development). 'Brandes' averaged 133 days to maturity and ranged from 118 to 155 days. 'Mer. 67-9', 'Mer. 70-1', and 'Mer. 70-2' showed considerable variation in maturity within plots.

Table 7 contains data on diseases of economic importance. Disease effects were evaluated on reductions in plant yield and quality and on percentage of leaf destruction. Rough spot infection was severe in tests in Alabama and Florida; Experiment, Ga.; and Lorman and Verona, Miss. Bacterial stripe was heavy at Blairsville, Ga., and rust and zonate leaf spot were severe at Houma, La. 'Brandes' and 'Mer. 67-18' showed resistance to rust at Houma.

TABLE 1.—*Yield of stripped stalks*

Location	'Brandes' (tons/ acre)	Pct of 'Brandes'												LSD at—	
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Wil- liams'	0.05 level	0.01 level
Alabama: Crossville	19.3	121	126	134	108	123	100	....	....	....	....	....	....	10.3	14.0
Georgia:															
Blairsville	16.7	122	93	70	88	104	79	187	151	114	138	135	105	20.4	27.2
Experiment	16.7	114	84	102	80	86	67	107	105	68	100	80	62	24.6	33.1
Mean	16.7	118	88	86	84	95	73	147	128	91	119	108	84	....	....
Mississippi:															
Lorman	11.4	135	160	145	126	111	96	....	....	....	....	....	....	15.6	21.4
Meridian	21.8	123	110	119	102	114	87	139	120	....	....	....	....	19.7	26.6
Pontotoc	22.1	121	119	124	88	117	74	....	....	....	....	....	....	10.0	13.7
Verona	25.0	121	138	122	120	117	89	....	....	....	....	....	....	10.6	14.6
Mean	20.1	125	132	128	109	115	86	139	120	....	....	....	....	....	....
Mean of means	18.7	121	115	116	100	111	86	143	124	....	....	....	....	....	....

LSD Least significant difference.

TABLE 2.—*Juice extraction*

Location	'Brandes' (pct)	Pct of 'Brandes'												LSD at—	
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Williams'	0.05 level	0.01 level
Alabama: Crossville	44.9	109	101	100	97	110	103	....	....	....	....	....	....	7.1	NS
Georgia:															
Blairsville	51.4	105	100	97	103	106	104	106	107	106	105	99	107	5.3	7.1
Experiment	47.3	109	103	105	104	114	102	106	106	100	103	99	104	6.6	8.9
Mean	49.3	107	102	101	104	110	103	106	106	103	104	99	106	....	....
Louisiana: Houma	33.8	120	138	125	126	146	127	142	131	....	129	141	135	....	....
Mississippi:															
Lorman	41.2	109	113	108	108	126	118	....	....	....	....	....	....	7.8	10.7
Meridian	47.8	104	106	101	101	114	107	110	107	....	....	....	....	5.0	6.7
Pontotoc	45.9	102	104	102	105	116	99	....	....	....	....	....	....	5.0	6.8
Verona	45.7	108	109	105	112	116	110	....	....	....	....	....	....	7.0	9.7
Mean	45.2	106	108	104	106	118	108	....	....	....	....	....	....	....	....
Mean of means	43.3	110	112	108	108	121	110	119	115	103	116	120	120	....	....

LSD Least significant difference. NS Not significant.

TABLE 3.—*Brix analysis*

Location	'Brandes'	Pct of 'Brandes'												LSD at—	
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Williams'	0.05 level	0.01 level
Alabama: Crossville	23.1	92	91	92	97	94	101	....	....	....	....	....	....	4.2	5.6
Georgia:															
Blairsville	16.5	85	94	90	101	110	104	104	104	103	92	102	96	9.3	12.4
Experiment	20.7	99	94	96	112	83	109	103	98	103	83	94	95	6.2	8.3
Mean	18.6	92	94	93	106	96	106	104	101	103	88	98	96	....	....
Louisiana: Houma	16.6	89	67	69	90	88	100	82	108	....	72	86	86	....	....
Mississippi:															
Lorman	15.7	104	116	115	132	101	145	....	....	....	....	....	....	9.0	12.4
Meridian	17.3	99	106	101	104	88	112	112	102	....	....	....	....	6.8	9.2
Pontotoc	18.3	96	98	96	107	90	113	....	....	....	....	....	....	6.8	9.3
Verona	16.9	92	93	98	96	78	92	....	....	....	....	....	....	6.3	8.6
Mean	17.0	98	103	102	110	89	116	....	....	....	....	....	....	....	....
Mean of means	18.8	93	89	89	101	92	106	99	104	103	80	92	91	....	....

LSD Least significant difference.

TABLE 4.—*Sirup yield per net ton of stalks*

Location	'Brandes' (gal/ton)	Pct of 'Brandes'											
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Williams'
Alabama: Crossville	17.2	102	94	97	87	101	101	....	....	....	....	....	....
Georgia:													
Blairsville	14.2	94	92	82	104	104	111	109	106	107	103	101	107
Experiment	16.8	112	96	103	[1]	92	101	104	106	101	87	95	[1]
Mean	15.5	103	94	95	52	98	106	107	106	104	95	98	54
Mississippi:													
Lorman	10.5	110	135	133	148	131	164	....	....	....	....	....	....
Meridian	14.5	106	112	101	107	97	112	115	110	....	....	....	....
Pontotoc	14.5	101	106	103	123	114	111	....	....	....	....	....	....
Verona	12.6	104	106	110	113	102	110	....	....	....	....	....	....
Mean	13.0	105	115	112	123	111	124	....	....	....	....	....	....
Mean of means	15.2	103	101	101	87	103	110	111	108	104	95	98	54

[1] Failed to boil to sirup of proper density (108° C).

TABLE 5.—*Sirup yield per acre*

Location	'Brandes' (gal/acre)	Pct of 'Brandes'											
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Williams'
Alabama: Crossville	331	124	118	130	94	124	101	...	...	...	...	...	...
Georgia:													
Blairsville	236	116	86	58	91	108	89	205	161	122	143	138	114
Experiment	281	127	80	105	[1]	79	68	111	112	68	86	75	[1]
Mean	258	122	83	82	46	94	78	158	136	95	114	106	57
Mississippi:													
Lorman	119	150	218	194	187	146	160	...	...	...	...	...	...
Meridian	317	131	123	121	109	109	97	159	131	...	...	...	...
Pontotoc	321	122	125	127	108	133	82	...	...	...	...	...	...
Verona	316	126	146	134	134	119	98	...	...	...	...	...	...
Mean	268	132	153	144	134	127	109	...	...	...	...	...	...
Mean of means	286	126	118	119	91	115	96	158	134	95	114	106	57

[1] Failed to boil to sirup of proper density (108° C).

TABLE 6.—*Days from planting to harvest*

Location	'Brandes' (standard)	Test variety											
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Williams'
Alabama: Crossville	118	118	118	118	118	118	118	118	118	...	...	...	...
Georgia:													
Blairsville	137	137	137	137	137	137	137	137	137	137	137	137	137
Experiment	137	137	137	137	137	137	137	137	137	137	137	137	137
Mean	137	137	137	137	137	137	137	137	137	137	137	137	137
Mississippi:													
Lorman	155	155	132	132	132	155	132	...	...	...	...	...	...
Meridian	150	150	142	150	142	142	128	142	142	...	...	...	...
Pontotoc	136	136	136	136	136	136	136	...	...	...	...	...	...
Verona	135	135	135	135	135	135	135	...	...	...	...	...	...
Mean	144	144	136	138	136	142	133	...	...	...	...	...	...
Mean of means	133	133	130	131	130	132	129	132	132	137	137	137	137

TABLE 7.—*Diseases of economic importance in 14 sweet sorghum sirup varieties*[1]

Location	'Brandes' (standard)	Test variety												
		'Mer. 67-9'	'Mer. 67-10'	'Mer. 67-11'	'Mer. 67-17'	'Mer. 67-18'	'Dale'	'GA 710 Sy'	'1845E'	'1984E'	'Mer. 70-1'	'Mer. 70-2'	'Williams'	'Honey'
Alabama: Crossville	INS, RS	RS	.....	RS	RS	RS	RS	.....	.....	.....	.....	.....	.....	INS
Florida: Quincy	RS	RS	RS	RS	R, RS	RS	RS	R, RS	RS	.....	.....	.....	.....	.....
Georgia:														
Blairsville	.....	BS	.....	.....	BS	BS	.....	BS, R	.....	.....	BS, R	BS	BS	.....
Experiment	RS	RS	RS	.....	RS	LB	RS	RS	RS	PS, RS	RS	RS	RS	RS
Louisiana: Houma	GLS, ZLS	GLS	R	R, ZLS	R, ZLS	GLS	R, ZLS	R, ZLS	ZLS	.....	R, ZLS	R, ZLS	R, ZLS	.....
Mississippi:														
Lorman	.....	RS	RS	RS	.....	RS	.....	.....	.....	.....	.....	.....	.....	GLS, RS
Meridian	.....	RS	.....	.....	BS	.....	BS, RS	.....	.....	.....	.....	.....	.....	.....
Pontotoc	RS	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	RS
Verona	GLS. RS	.....	RS	RS	RS	RS	RS	.....	.....	.....	.....	.....	.....	GLS, RS

[1] The presence of disease is indicated only when it was severe enough to have caused a reduction in yield or quality. BS Bacterial stripe. GLS Gray leaf spot. INS Insecticide injury. PS Physiological spotting. R Rust. RS Rough spot. ZLS Zonate leaf spot.

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